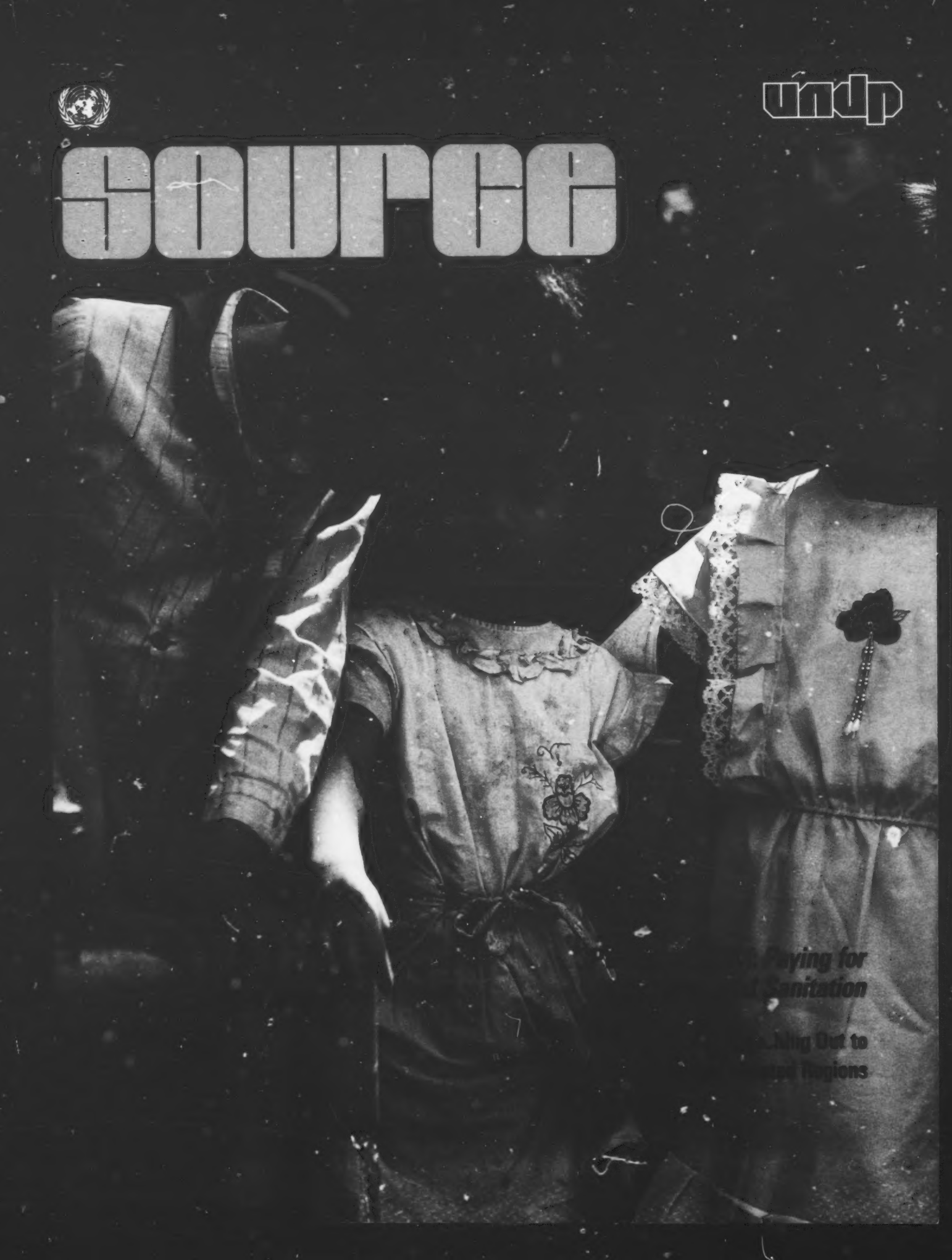
undp

SOURCE



Guinea worm Eradication:

The Need for a Concerted Effort

By Jimmy Carter

Carter Presidential Center

Former US President Jimmy Carter

As the Water and Sanitation Decade draws to a close, we can take satisfaction in the progress we have made toward the eradication of Guinea worm *(dracunculiasis)*. The Carter Center's Global 2000 project has formed a strong alliance with the Centers for Disease Control and other international health organizations. United Nations Children's Fund (UNICEF) and the United Nations Development Programme (UNDP) have each allocated over one million dollars to conduct initial surveys, develop national plans of action, and support rural water supply projects in some endemic areas. The World Health Organization has convened four regional meetings, held a consultation funded by UNDP on criteria for certification of eliminating the disease, and adopted a resolution in its African Regional Committee calling for total eradication of Guinea worm by the end of 1995. In addition, the Africa section of the World Bank is now exploring how it might assist Guinea worm eradication efforts.

This linkage between world health organizations is in itself unusual, but The Carter Center has also fashioned a unique partnership with business and government. Several months ago, American Cyanamid Co. donated all the Abate larvicide needed for the remainder of the Guinea worm eradication campaign. E.I. Dupont de Nemours, in conjunction with Precision Fabrics Group, has donated 1.4 million reusable nylon filters to strain drinking water. The USAID mission in Ghana is providing over US$2 million to that country for its eradication programme. The Japanese International Co-operation Agency has supported major rural water supply projects for villages with Guinea worm in Ghana and Nigeria, two countries whose heads of government have endorsed and supported national eradication programmes. The Swedish International Development Agency, the Dutch government, the NGO alliance IMPACT, Band Aid, Rotary, the US Peace Corps, and others are assisting eradication efforts in various countries. I am also encouraged by the recent statements supporting Guinea worm eradication issued at the conclusion of the All-Africa Water and Sanitation Workshop and Sector Conference at Abidjan in May, and outlined in the "New Delhi Statement" in September.

But to achieve global eradication by the end of 1995, national authorities and their counterparts in international assistance agencies need to make a concerted effort to bring the weight of the rural water supply sector to bear on Guinea worm eradication.

The water and sanitation sector should take advantage of the Guinea worm eradication campaign to set priorities for providing safe drinking water based on health and economic criteria. Villages with Guinea worm are most in need of safe water, since the presence of the disease affects food production and school attendance in addition to contributing to the other negative health consequences of unsafe drinking water. Moreover, providing safe drinking water to villages with Guinea worm can spur the mobilization of villagers, especially women, in the eradication process by providing a visible goal that is easily reached.

The Water Decade provided several examples of the dramatic impact that providing safe drinking water can have on eradicating Guinea worm. In Nigeria's Kwara State, for example, a UNICEF-assisted rural water supply programme reduced the average prevalence of Guinea

Continued on page 31

SOURCE

December 1990

Page 10: A private Malian co-operative helps bridge gaps in urban sanitation services.

Page 14: Zimbabwe's low-cost Bucket Pump is gaining widespread acceptance.

Cover: Rural Chinese are getting their first taste of safe drinking water. UNDP photo by Sid Kane. Story page on 18.

2 LOOKING AHEAD Guinea worm Eradication

4 SPECIAL REPORT Paying for Water and Sanitation

5 Argentina's Waterworks Go Private

8 Cashing in on Crops to Keep Togo's Pumps Flowing

10 Cleaning Up Mali—And Making It Pay

14 AFRICA Zimbabwe Pioneers Low-Cost Technologies

18 ASIA Reaching Out to China's Isolated Regions

22 HEALTH Stalking an Ancient Disease of the Nile

26 TECHNOLOGY Tapping Fog for Water

29 DONOR PROFILE Helping the Poorest: Norway's Water and Health Strategy

30 NEWS Global Meeting Sets Water and Health Targets to Year 2000

31 IN PRINT

Articles may be freely reproduced so long as credit is given and tear sheets are provided to the Editors.

Published quarterly by:
Division of Information, United Nations Development Programme, One UN Plaza, New York, NY 10017. Fax: (212) 906 5364

VOL.2, NO.4

Director:
J. Russell Boner
Editor-in-Chief:
Lloyd Garrison
Executive Editor:
David Kinley
Editor:
Emma Robson
Design:
Esther Kurti, Director
Nieves Singian, Assistant
Maureen Lynch
Editorial Assistants:
Mila Feliciano
Jennifer Prince
Translations Manager:
Elizabeth Scott Andrews
Production:
Linda Inocencio-Groux
Annie Straw
Afsaneh Djabbari
Danielle Strahl
Circulation:
Alison Walton
Dorothy Toy
Distribution:
Welde Hailemelekot
Aubrey Trotman

The boundaries and names shown on all maps do not imply official endorsement by the United Nations.

Ruth Massey / UNDP

Paying for Water and Sanitation

United Nations, New York—In the 1990s, at a time when they are hard pressed to afford it, developing country governments face the task of providing safe water to an additional 1.2 billion people. Another 1.7 billion people lack adequate sanitation.

Rapid population growth is making water more scarce. Increased human and industrial activity are making it more polluted. Such factors, together with sharply higher energy costs, point toward a higher price tag for these basic services.

The current economic outlook offers little hope of a reversal of the negative trend of the 1980s, during which more than half of the developing countries experienced negative growth in per capita income. Hence the level of funding of water supply and sanitation services is unlikely to increase much in real terms over the next few years.

The answer lies more in how money is spent and collected. Considerable funds could be freed up for the poor, who often pay exorbitant prices for inadequate services, if first, governments charged all users for the water they consume, and second, they improved collection of fees.

Privatization is an option for raising efficiency without straining the national budget. If a government can neither afford to get a job done, nor do it well, profit motives can inspire the private sector to do it better. Decentralization can also help.

Beneficiaries themselves can be persuaded to shoulder part of the burden of financing and maintenance of facilities. If they lack incentives, health education can help generate demand and convince them of the virtue of paying for their own well-being.

This special report looks at three initiatives aimed at making water and sanitation more affordable to governments and more appreciated by people, who can help bridge the spending gap. While it is too early to say whether these particular experiments will succeed, they appear to be promising approaches to serving the unserved.

—Emma Robson.

READEX MICROFILMED

Argentina's Waterworks Go Private

By Emma Robson

Buenos Aires, Argentina— Shimmering in the sun, this towering early 20th century building on Córdoba Avenue reflects the wealth, splendour and European grandeur of an Argentina that was. Today the elegance of the tiled, pink structure, whose every piece was imported from England and France, stands in stark contrast to the state enterprise it serves: Argentina's financially-troubled water and sanitation company, Obras Sanitarias.

Behind the elegant headquarters' façade, Obras Sanitarias has been plagued with weak management, overstaffing, and an inefficient water and sanitation tariff system. For years, the company has skipped maintenance in its struggle to generate enough funds just to meet salary costs. Still, with monthly inflation often running into double digits, many of its 9,300 workers make so little that they hold second jobs. Among the results are leaking underground water pipes and a 75-year-old sanitation network that now serves just over half the capital's nine million residents. The other half uses septic tanks and latrines that pollute the capital city's groundwater. For drinking, some three million people use pumped water supplies which are often chemically-contaminated.

Armanda Palermo, UNDP

The Obras Sanitarias building in Buenos Aires

"Since 1980, we've been going backwards," says Armando Guibert, an industrial engineer. "Without radical measures, eventually no one in this country would have safe water. The entire system is on the verge of collapse."

In 1980, responsibility for water and sanitation services in other urban areas was handed over to local authorities. The move, aimed at greater efficiency, allowed Obras Sanitarias to concentrate on the capital. But the decentralization coincided with the start of a rapid downturn in Argentina's economy. Hyperinflation, stagnant growth, mounting foreign debt and an empty state coffer have led to a serious deterioration in all social services.

During the 1980s, national spending on water supply and sanitation averaged slightly more than US$85 million a year. But little of that was spent on maintaining the sewerage and water supply systems. Much was syphoned off through operation costs which were not recovered through user charges. In Buenos Aires, Obras Sanitarias recoups an average of 80 per cent of its investments. The provincial utilities are lucky to get back half of what they spend. Many have no metering systems and rely on inefficient domestic rates based on the surface area of property, not quantity of water consumed. In the same ten-year period, millions of dollars in urgently-needed credits from the Inter-American Development Bank and World Bank for sector improvements languished in Washington, DC for want of required funding contributions from the Argentine government.

Recognizing that urgent action was needed, the Ministry of Water Resources called for a plan aimed at overhauling the crumbling system. In 1987, with support from the United Nations Development Programme (UNDP), a team including Mr. Guibert set to work on co-ordinating the activities of the decentralized authorities, improving deployment of existing resources, while keeping management under the Ministry of Public Works and Services.

But when President Carlos Menem took over in Summer 1989, Obras

Sanitarias was targeted as a prime candidate for his sweeping plan to privatize most state companies. The UNDP-funded team of trouble-shooters, working within the Secretariat of Water Resources, swiftly changed course, expediting experts to England and France to study two approaches to privatization. They examined Britain's sale of shares in its major water authorities to the public, and France's experience of running utilities through private concessions. They opted for the model of France's Compagnie Générale Lyonnaise des Eaux as a method of privatizing Obras Sanitarias.

Rights to management of the utility will be transferred next year to a private company for an initial 20-year period. The outright sale along British lines was not deemed feasible in Argentina, which has neither large amounts of private capital nor well-developed capital markets. "The Argentine companies best suited to taking over would have been unable to raise the money to buy the company outright," says Rodolfo Gianoni, director of the project.

The arrangement appears to benefit the government, investors and consumers alike. For the government it involves no sale of real estate or assets and no investments, yet it will remove a large financial burden and hopefully bring long-awaited services to millions of Argentines.

Two serious domestic investors have already deposited more than $10 million, confirming their interest in taking over management in 1991. For them, the concession could yield an annual gross return on their investment of more than 20 per cent, according to earnings projections drawn up by the UNDP consultants. During the 20 years of the agreed term, whoever manages the concession is expected to invest $800 million. Moreover, the title to existing infrastructure and all improvements they make will remain with the state. "It's a good deal for the state," says Pablo Rojo, an economist who prepared the transaction's legal aspects. "And its a solid investment for a company."

The new management will be required to engineer substantial improvements. All leaks must be plugged, sewage treatment plants upgraded, water quality improved, and coverage of both piped water supply and improved sanitation must be raised to at least 55 per cent within the 20-year period. Since Buenos Aires' already overburdened sanitation system cannot support further connections, the new managers will be expected to find alternative solutions.

Photos by Emma Robson - UNDP

Poorer districts of Buenos Aires have inadequate or contaminated water supplies and virtually no sanitation services.

Argentina's economic crisis has brought a widespread deterioration in living conditions

All these improvements must be carried out at the lowest possible cost to the public. "The contract will be given to the company deemed capable of meeting the goals through the lowest public tariffs," says Mr. Rojo.

In granting a management concession, the government will be allowing the private group the independence necessary to make radical changes—a freedom which its previous managers lacked. The company's performance will be tracked, but not governed, by an independent board represented by members of municipal, provincial and central governments. To help get the concession started, the government hopes to transfer up to $400 million of an undisbursed credit from the World Bank to cover the mandated investment costs.

One of the firm's first tasks will be to revamp the capital's tariff system. "In practice, some domestic users pay a lot for an intermittent water supply, while others pay very little for a more reliable, ample service," says Mr. Rojo. The metering system used to charge industrial users will probably be tightened, and the collection of fees enforced more rigidly. Currently, those industrial users who are billed often skip payment without fear of any consequences. "With privatization, if the company doesn't pay, its water will be cut off," says Mr. Rojo.

By plugging the leaks in Buenos Aires' turn-of-the-century pipes, the company will also reap rewards when it starts to meter water consumption efficiently. At 600 litres per person per day, Buenos Aires consumes an enormous quantity of water. An estimated 40 per cent of that water goes unaccounted for. A fairer system should improve the quality of life of existing water consumers, most of whom spent many hours during the exceptionally dry summer of 1989 in darkness and without running water. Much of the city's water comes from a large reservoir which also generates Buenos Aires' electricity. When drought, combined with the heavy leakage, lowered the reservoir's water level, faucets ran dry and electricity blackouts ensued.

Overstaffing is another weakness of Obras Sanitarias. In a study comparing the water and sanitation company of Barcelona with that of Buenos Aires, which serves a similar number of people, the UNDP privatization team found the Spanish company employed one-sixth of the staff of the Argentine authority. About one-third of Obras Sanitarias' employees are over 65. "Under new national legislation these people will have to retire and make way for young blood," says Mr. Rojo.

The government plans to enforce retirement among its public employees prior to privatization. Fortunately for the economy, once the over-aged employees are retired, the investments and improvements required of the new investors are likely to create jobs. But staffing will be the responsibility of the new company. "The union was not too keen on the plan," says Mr. Rojo. "But it was encouraged by the fact that employees will be given shares in up to ten per cent of the new company." Moreover, the number of annual new connections required under the terms should stimulate the country's stagnant construction industry.

If the Buenos Aires experience is successful, privatization will be used nationally as a tool to bring better services and a better environment to other towns and cities. More than 30 per cent of the nation's urban dwellers still lack piped water supplies, and more than 60 per cent remain unconnected to a sewerage system or treatment plant. ■

Judith Graham

Atsou Kodjo (left) and the village chief, Abbaya Adissaou, have big plans for Egbé.

Cashing in on Crops to Keep Togo's Pumps Flowing

By Judith Graham

Egbé, Togo—Atsou Kodjo likes to think ahead. Now that the new village health centre is finished, he is thinking of building a small mill nearby to save the women time in grinding meal. After that, he thinks a school would be a worthwhile project.

These are big plans for a mud hut community of less than 500 people, surrounded by small subsistence farms. But Mr. Kodjo, president of the village development committee, can afford to think big. Since the village started a cotton and maize farm cooperative several years ago, its people have put more than US$1,750 in a community bank account. "It is a very good thing we're making money," says Mr. Kodjo, "but we have also learned how to save."

Egbé is not the only Togolese village able to save these days. Since a Canadian-supported water project began in 1984, more than 200 communities in Togo's Maritime Region have set up income-generating projects. By combining the provision of handpumps with farming, the project aimed to ensure that the villages would make enough money to cover pump repairs and maintenance indefinitely. If they earned enough to improve community facilities, all the better.

"Our idea was to create a sustainable development project around water, rather than a water project with some emphasis on development," says André Guindon, director of the project, which is financed by the Canadian and Togolese governments and executed by CUSO, a Canadian

UNDP is assisting UPROMA, a Togolese company manufacturing handpumps.

non-governmental organization.

With a budget of $8.3 million, in six years CUSO has drilled more than 200 tubewells and equipped them with locally-made India Mark II handpumps and French-made Vergnet pumps. Safe water was brought for the first time to 65,000 rural people. More than 100 wells were rehabilitated and over 500 families agreed to pay up to one-third of the cost of building Ventilated Improved Pit latrines. In addition, communities assumed responsibility for 130 handpumps installed by previous projects.

All villages now have functioning development committees, which were formed before the well drilling began. Villagers took part in many aspects of planning and decision-making, and their commitment to financing and managing pump maintenance was sealed with a contract, signed by the development committees and the project workers.

A three-step pump maintenance system was put in place. At the village level, two committee members routinely check equipment and perform minor repairs. If more skilled work is needed, villages hire local private mechanics. Major repairs are handled by three pump technicians from Togo's Hydraulics Ministry, who also train village handpump caretakers.

But with an average of $240 stashed away in bank accounts, not all villages are as rich as Egbé, which has a long tradition of farming collectively. Moreover, up to 75 per cent of the pumps installed several years before are either rusted or damaged and in need of replacement. Many of them were installed improperly and their rods are broken.

To enhance people's awareness of the need to keep their pumps flowing, and the surroundings clean, a health education campaign was launched in April 1989. The campaign focused on raising people's awareness of the causes of Guinea worm disease, a waterborne parasite transmitted to humans through contaminated drinking water.

While the health education was slow to make an impact on peoples' behaviour, the income-generating activities, particularly agriculture, caught on more quickly. "As long as every family puts in a few hours a week during the rainy season, the communities make money at the market almost automatically," says Mr. Guindon.

With CUSO support due to end this year, the villages will soon be operating independently. Many of the villages will have to work hard at farming to raise their average savings, which currently would not meet the price of two replacement handpumps. "It is going to be difficult," says Mr. Guindon, echoing the view of other water sector experts familiar with the Togo experiment.

To date, the efforts of international donors and Togo nationals have yielded vast improvements in the country's water supply services. In 1981, less than ten per cent of the rural population had access to clean water. This year, nearly 50 per cent of rural inhabitants—an estimated one million people—have safe water at hand.

Only time will tell whether those improvements last. The people of Egbé are confident that their commitment to pumps and agriculture will endure. "All of the families farm together," says Mr. Kodjo. As for the village pump, "whatever repairs are necessary, we have the money to do them," he says. "We know how important it is to have our pump. Before we had to walk to a pond four kilometres away, and when that was dry, we went as far as 15 kilometres." ■

Judith Graham is a US-based freelance writer.

Cleaning Up Mali—And Making It Pay

By Emma Robson

Bamako's new sanitation co-operative hopes to make money out of garbage collection.

Bamako, Mali—Wearing green overalls and high-heeled open sandals, Siga Keita stoops gracefully to pick up a 230-litre dustbin with her well-manicured hands. She grimaces slightly at the stench of rotting refuse as she tips the drum into the back of a garbage truck. One hour and six dustbins later, Ms. Keita and partner, also a woman, have earned US$20.

Collecting garbage may seem an undignified occupation for a lady, and particularly for a university graduate. But Ms. Keita and 15 other well-qualified women who together formed a co-operative see the offensive aspects of their job as a small price to pay in their bid to clean up the capital and perhaps gain some financial independence.

In the late 1980s, when these women were leaving university, the Malian government had stopped hiring graduates for the civil service, which employs more than half the active workforce. With an average of five years at university, Ms. Keita and her colleagues joined the 50 per cent of Malian graduates who are jobless and still financially dependent on their families or spouses.

Unemployment, particularly among white-collar workers, has soared in recent years as the government has slashed public sector jobs to conform to an austerity programme worked out with the World Bank and International Monetary Fund in 1986.

Desperate for work, Ishata Sahi, who holds degrees in English and teaching, responded to a radio advertisement for graduates willing to work as sanitation workers and health promoters. After a thorough examination, she was accepted. "At first I thought it was inappropriate for me, with my two diplomas, to collect garbage," says Ms. Sahi. "But I told myself it was a challenge. I would make some money and help the community."

Photo by Emma Robson UNDP

Women discuss picture cards portraying approaches to better hygiene.

Credit for the initiative, dubbed "Women, Health, Jobs," goes to Aminata Traoré, who came up with the idea while working in Bamako, her native city, as a family planning consultant. "I was concerned about the increasing quantities of rubbish, the rapidly-expanding population, and high numbers of women who had sacrificed so much to get a degree, yet had no job."

Ms. Traoré's plan was to select a small group of graduates, give them training in health education, and send them into a Bamako neighbourhood to help motivate people to improve their hygiene practices. The idea was that once families realized the importance of cleanliness, they would want to pay the graduates to make daily rubbish collections. Ultimately, the garbage collection co-operative would generate enough money to finance the creation of 16 new companies, headed by each of the graduates.

Ms. Traoré heads the African division of PROWWESS (Promotion of the Role of Women in Water and Environmental Sanitation Services), a project of the United Nations Development Programme (UNDP). She took her idea to the United Nations Fund for Women (UNIFEM). UNIFEM agreed to support the project, contributing $58,000 to cover the cost of two garbage trucks. UNDP and PROWWESS provided the graduates with training in business management and health promotion. Ms. Traoré also approached her former employer, the United Nations Population Fund (UNFPA), which saw community hygiene training as an ideal entry point for family planning. UNFPA agreed to finance the production of family planning training material by local artists.

In late 1989, the graduates each contributed $188 to a fund to cover truck maintenance, fuel, drivers, collection helpers and to manufacture dustbins from used vehicles. In January 1990, work began. Médina-Coura, a particularly neglected district of Bamako, was selected as a pilot zone for providing health training to more than 730 family compounds. Parallel to the health education, the graduates marketed their

Photo by Emma Robson / UNDP

Sanitation and road maintenance take up one-third of Bamako's city budget, according to District Governor Yaya Bagayogo (above).

garbage collection services, and won one contract to make a weekly round-up of rubbish at a veterinary laboratory each Saturday for $20.

The graduates had to abandon a plan to charge families $5.60 a month for a daily garbage collection when a majority of families surveyed said they could not afford it. "It is difficult enough to convince families that buying a dustbin with a lid pays off in health terms," says Olaiga Hindou, the graduate in charge of dustbin production. Of the nearly 400 dustbins the co-operative has manufactured, only slightly more than half have been sold.

Instead, the co-op decided to approach the municipalities. Impressed with their work with local families, the mayor of Médina-Coura gave them a daily collection contract for one year, worth $34,000. "We have yet to cover our costs, so we don't get a salary," says Ms. Hindou, "but we are determined to succeed." Enthusiastic responses from the mayors of several other municipalities are raising the graduates' hopes that they will soon be able to purchase more trucks, expand their service and turn in a profit. "We are convinced there is a big market for rubbish collection in Bamako," says Ms. Hindou.

The district governor of Bamako, Yaya Bagayogo, is also convinced that the capital has a major waste disposal problem. "All this stagnant water and waste causes diseases like malaria and diarrhoea and can pollute the groundwater," says Mr. Bagayogo. He too is seeking ways of financing a clean-up programme.

The city has requested a World Bank credit to buy more garbage trucks, hire more sanitation personnel, and to train them to do their job more efficiently. But that credit is unlikely to be disbursed before 1992. "If we are to get a loan, we'll have to find a way of paying it back," says the governor. "Every household is supposed to pay city taxes. But of the $1.2 million we're meant to collect in service charges, we're only collecting $120,000."

Sanitation and road maintenance take up one-third of the city's total annual budget of $5.6 million. But less than half of the more than 2,000 cubic metres of garbage generated daily by Bamako's 700,000 inhabitants is collected. The rest piles up in front of houses and on the streets. It blocks the city's open sewers, obstructs traffic in market places and creates breeding grounds for disease-carrying insects and rodents.

In the run-up to 1992, Mr. Bagayogo plans to simplify the current rates system for water and sanitation services, and enforce payment. As for the graduates, Mr. Bagayogo believes that such awareness-raising work is essential if the stricter tariff system is to be a success. "In order to get people's co-operation, we have to educate them and make them responsible for their own hygiene. PROWWESS and the graduates have shown an effective way of achieving this," he says. ■

A seminar participant gives an animated interpretation of a hygiene picture card.

As the day winds down in the Médina-Coura section of Bamako, small children, their hands and faces besmirched with a day's play, wander barefoot around the compound of the Bandjougou Boudié Traoré family. In one corner of the compound yard, a hen struts past a wheelbarrow, piled high with rotting refuse. In another corner, the cook is steaming ground millet over a smoking fire. Her assistant, bent over a concrete trough, stops every few seconds to waft away a swarm of flies as she washes the rice and sauce-encrusted pots and pans dirtied at lunch.

The 40 or so family members are sitting in the middle of the yard, where they are animatedly discussing the principles of better hygiene. They comment, point and make disapproving sounds as they scrutinize a series of picture cards.

"This is very unhygienic," says a male family member assertively. "That water is dirty and is attracting flies. And look. She has piled all the rubbish in the middle of her yard where it can cause disease." The others agree. "The toilets are open, and the woman doing the washing up is surrounded by dirt," says an older woman.

The irony is, that while all the adult members of the Bandjougou Boudié Traoré family can propose solutions to the unhygienic practices they identify in the pictures, they have yet to apply these solutions to their own situation.

"This will come with time," says Kama Sakiliba, one of 16 female graduates working to promote health in the Malian capital. "The fact that they can recognize unhealthy situations, link them to diseases like diarrhoea and malaria, and put forward solutions, shows that they are making good progress."

The group of hygiene trainers uses materials prepared by PROWWESS, which aims to raise awareness using participatory visual and audio-visual materials that encourage individual expression and confidence.

One effective tool used in Médina-Coura is a set of cards showing unhealthy and healthy environments. Family members are split into groups and the cards, designed by local artists, are distributed. The groups are asked to discuss among themselves whether they think their cards are positive or negative. Then a person nominated by each group is asked to give a presentation, explaining the health implications of practices portrayed in the pictures.

Towards the end of the one-hour session at the Bandjougou Boudié Traoré compound, there were signs that the messages were beginning to filter through. A respected female elder presented a picture showing only positive elements. "The house is clean, the woman is clean, and there is a dustbin with a lid," said the woman. "I am urging all present to follow this example. Let's keep our compound clean." She returned to her seat to a storm of applause. ■

Four of the teachers involved in hygiene education.

Anna Ngundu gets water from this Bucket Pump outside her home.

Zimbabwe Pioneers Low-Cost Technologies

By David Kinley

Ngundu, Zimbabwe—A blustery, overcast day closes with an amber burst of sunlight as Ms. Anna Ngundu steps outside her cinderblock home to fill a metal canister from a so-called "bucket pump." Standing on a circular concrete apron in the middle of her yard she grasps a thin metal chain, lowers a slender steel bucket down a plastic tube in the ground and pulls up five litres of clear, pure drinking water. Moments later, Ms. Ngundu is back in her kitchen with enough water to prepare the evening meal.

"People from many neighbouring villages come here to see our Bucket Pump," she says. "We have three in Ngundu, plus two Blair Pumps and one Bush Pump that serve about one hundred households. Since we got them three years ago, people's health has improved dramatically."

Ever since she was elected as the village community worker in 1987, Ms. Ngundu has been spreading the word about the benefits of improved water supplies and better hygiene to hundreds of rural families scattered across Marondera district, about two hours drive south-east of Harare, Zimbabwe's capital. In support of her small crusade, she receives a monthly stipend of US$28 from the Ministry of Community and Co-operative Development. Her skills were recently enhanced by three months of government-sponsored training in hygiene, cooking, sewing, gardening and construction of Blair Latrines.

More than 18,000 Zimbabwean Bush Pumps serve rural villagers today.

To the far side of Ms. Ngundu's home stands one of 38 latrines which she has helped to construct with her neighbours. As is typical throughout Zimbabwe, the structure is sturdy, colourfully decorated, odour-free and features separate facilities for women and men. More than 60 per cent of the costs of building these latrines was paid for by the families themselves, with the balance coming from the government. Since 1980, at least 200,000 such latrines have been erected throughout rural Zimbabwe. Each year, moreover, the country installs another 3,000 new water sources like those in Ngundu.

Of the dozens of developing nations pledging to deliver improved services to their people at the 1980 launch of the International Drinking Water Supply and Sanitation Decade, newly-independent Zimbabwe faced some of the most formidable obstacles. Nearly a century of colonial rule left the country with wide disparities between white-dominated cities and towns and the over-crowded tribal trust lands where over half of the African majority live. Income and wealth were concentrated in the hands of a relatively few farmers, ranchers and businessmen, many of them foreigners. Moreover, the long war for independence had disrupted or destroyed over half of the water supply systems in the countryside. By the time peace finally arrived in 1979, water-related diseases had combined with widespread poverty and malnutrition to push infant mortality in the rural areas to alarming levels.

"The tarmac road and almost every other service of Rhodesia's government stopped at the border of the Trust Territory," says Piers Cross, who works for the joint water and sanitation programme of the United Nations Development Programme (UNDP) and World Bank, and advises Zimbabwe's Ministry of Health on related issues. "Over two-thirds of these people had no access to improved water supplies and nine-tenths lacked adequate sanitation at the time of independence. Rural Zimbabwe was dominated by diseases associated with poor water and sanitation."

But through an impressive combination of government initiative, prudent application of foreign aid, local innovation, and popular participation, Zimbabwe has made great strides toward universal coverage during the past decade, especially in improving rural sanitation services. Indeed, within one year of assuming office, the government of President Robert Mugabe had established a National Committee to spearhead the Water and Sanitation Decade activities and set targets for the first three years of implementation. Heavy emphasis was placed on improvements in sorely neglected rural areas using locally available technologies.

Within three years the government aimed at—and attained—a doubling of the percentage of rural people served with safe water—from ten per cent to 20 per cent. It also set out to construct 60,000 latrines. Five years after that, rural water supply coverage had doubled again to 40 per cent, while rural sanitation rose to 25 per cent through the far-reaching latrine building campaign.

One reason for Zimbabwe's sus-

Latrines at school are part of Zimbabwe's efforts to introduce hygiene at an early age.

tained progress was the existence within the Ministry of Health of a pioneering research and development institute, the Blair Research Laboratory. Headed by an inventive marine biologist, Peter Morgan, Blair's efforts over the past 15 years have been devoted to carefully refining inexpensive, appropriate technical solutions to Africa's water supply and sanitation problems.

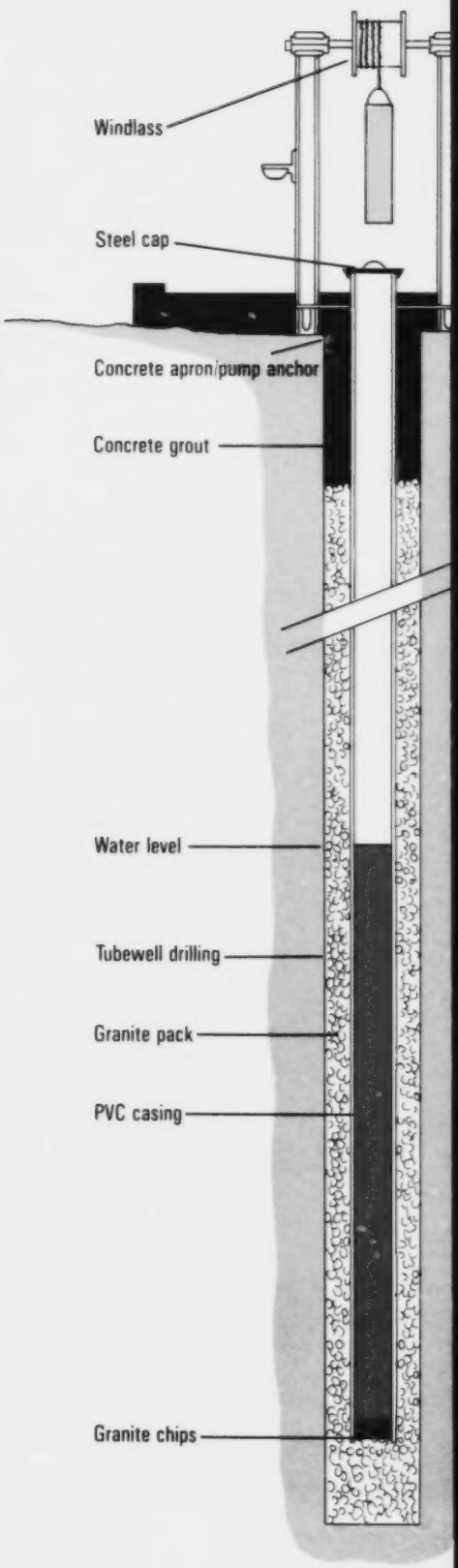
"The Blair Latrine is a type of ventilated pit latrine designed to overcome the main problems of the traditional models, namely flies and odours," says Dr. Morgan. "It uses principles found in nature, and these give the Blair its great dependability and popularity." The Blair Latrine has achieved such universal acceptance in every corner of Zimbabwe that now it is the government's goal to help build 1.4 million—one for every rural family by the early years of the next century.

A similar set of principles guides the Blair Lab's approach to rural water supply systems. "The handpump of choice for most installations is the time-tested Bush Pump, which is ideally suited for deep or heavy duty use," explains Dr. Morgan. "But where village-level maintenance is required, such conventional reciprocating handpumps may be too complex for villagers to repair themselves. Then the Zimbabwe Bucket Pump is more suitable, since it can be managed at village level with relatively little support from outside."

A second factor contributing to Zimbabwe's success in providing water has been the willingness of the local private businesses to make sizeable investments in the sector. Located on the outskirts of Harare is the V&W Engineering & Installations Company, directed by Erwin von Elling. The firm is one of several firms that manufactures water supply equipment for the government on a commercial basis. Inside several corrugated steel factory buildings, dozens of overall-clad Zimbabweans can be found welding, hammering and fitting together the country's three leading models of water-lifting equipment—Bush Pumps, Bucket Pumps and Blair Pumps.

"V&W has produced a large portion of the 18,000 Bush Pumps that are serving Zimbabwe's villages today," says Mr. von Elling. "The Bush

Bucket Pump Fitted on a Tubewell



Photos by David Kinley - UNDP

Manufacturer Erwin von Elling explains the merits of the Bucket Pump.

The Vonder Rig, produced by Zimbabwe's V&W Engineering, is gaining popularity as a cheap well-drilling device.

Pump's reliability has been proven beyond all doubt. Since the major drought in 1985, we have also produced over 6,000 Bucket Pumps and are expanding our manufacturing operations to meet growing demand." After extensive field testing, the Blair Pump, unlike the Blair Latrine, has not been selected for nationwide installation by the government.

Mr. von Elling hasn't been content just to manufacture pumps. Five years ago he began to look for a drilling technique which could substantially reduce the cost of handpump installation. "I designed and tested the prototype of the Vonder Rig in my own backyard," he says. "The current model can drill up to 40 metres deep with the work of a few village women. It can also be easily transported to remote locations where conventional rigs cannot be taken. The product is proving itself."

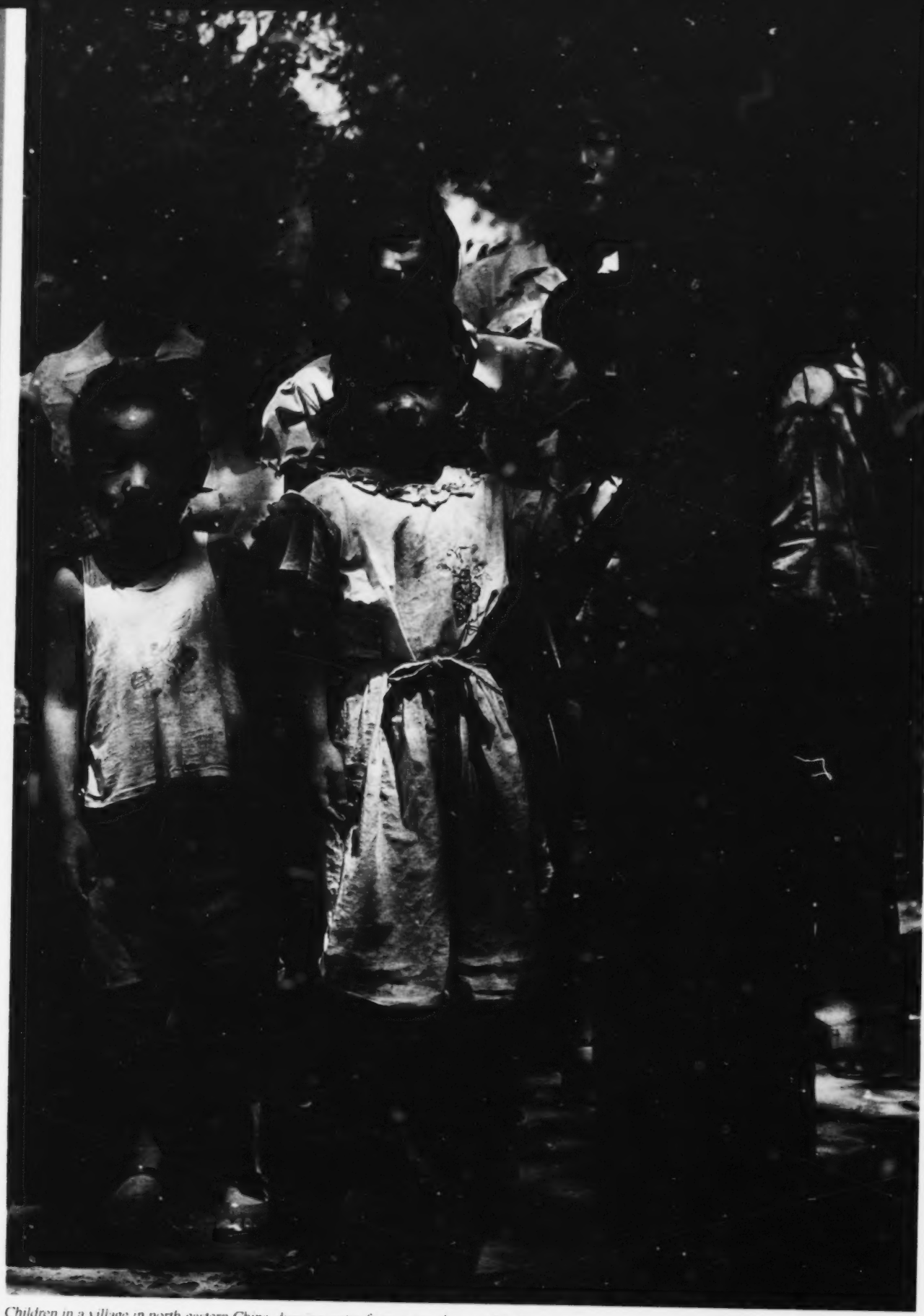
Indeed, Save the Children (UK), along with Germany's technical aid agency GTZ and other private aid organizations, is putting the Vonder Rig to steady use in their rural water supply programmes. Further afield, over 300 of them have been sold in at least 16 countries including Angola, Namibia, Kenya and Mozambique.

Zimbabwe's nationwide campaign has also benefited from the expert advice and support of the UNDP-World Bank programme. The programme has assisted the government in carrying out numerous studies critical to formulating national sectoral policy while providing training to dozens of local staff. The UNDP-World Bank team has also helped to set up a regional network training centre at the University of Zimbabwe to train national workers throughout Southern Africa.

Like other development efforts, the water and sanitation initiatives in Zimbabwe have their share of problems, most centering on issues of finance and sustainability. Some water engineers are critical of Zimbabwe's Bush Pump because its design leans too heavily toward durability as opposed to simplicity in repair. This results in an expensive government maintenance system. Other experts question the high levels of governmental subsidy to new sanitation and water supply installations, insisting that more of the burden must be borne by the beneficiaries to ensure sustainability. Still others are concerned about the programme's increasing dependency on concessional foreign financing.

"The Decade represented a transitory period in which the country spent heavily on expanding water and sanitation services while becoming more and more reliant on donor funds," says Mr. Cross of the UNDP-World Bank Programme. "The 1990s will present ever greater challenges as government funds become tighter, and donors begin to insist on self-sustaining programmes." If the experience of the 1980s is any indication, the challenge will be met. ■

Illustration: Maureen Lynch



Children in a village in north-eastern China drawing water from a new deep-set handpump.

Reaching Out to China's Isolated Regions

By Sid Kane

Xinjiang Province, China—As crews finished work on one of the first deep-set handpumps ever installed in this remote part of China, scores of sceptical Muslim villagers, stretched out on locally-made carpets beneath the vast desert sky, sat watching in awe. No one believed that clean, fresh water would soon be tapped from below the earth's surface, as the foreigners had claimed.

For these residents of Moyu county, an age-old community located on the fringe of the Taklimakan Desert—and many others like it in China's western frontier—water has come from one source for thousands of years: melted snow, running off from the plateau's high, snow-covered mountains.

But on this fateful day, scepticism turned to awe at the first sight of buckets overflowing with fresh well water. "They could not believe their eyes," recalls Kyaw Myint, a Burmese engineer working with the rural water supply project funded by the United Nations Development Programme (UNDP) with expertise provided by the World Bank. "In Xinjiang, clean water has always been within reach, only 30 metres below the surface," Mr. Myint says. "All that was missing was the technology."

Now, with help from international donors, that technology is finding its way into China's most remote regions—from the Islamic, desert cultures of the west to the sun-baked, clay villages of Inner Mongolia. "It seems like a small thing, a handpump, but it's had an enormous effect on whole communities of poor people," says Saul Arlosoroff, Operations Manager for the UNDP/World Bank Water Supply and Sanitation Programme in Asia.

The story of Moyu county and its people is the story of millions of China's rural poor, many of whom are farmers who are struggling at the subsistence level. According to the World Health Organization (WHO), 287 million people in rural parts of China—about 25 per cent of the country's population—still lack access to safe drinking water.

Deep-set handpumps, which tap fresh water from aquifers 20 to 40 metres below the ground, and which

Photos by Sid Kane / UNDP

Kyaw Myint (right) and Lim Desheng, a Langfang water official, check out a newly-installed handpump.

are now common in Africa and other parts of Asia, have been curiously absent in China. Instead, many rural inhabitants drink from streams, irrigation pipes or home-made suction pumps. The latter tap shallow water which is often contaminated, and are useless during dry seasons.

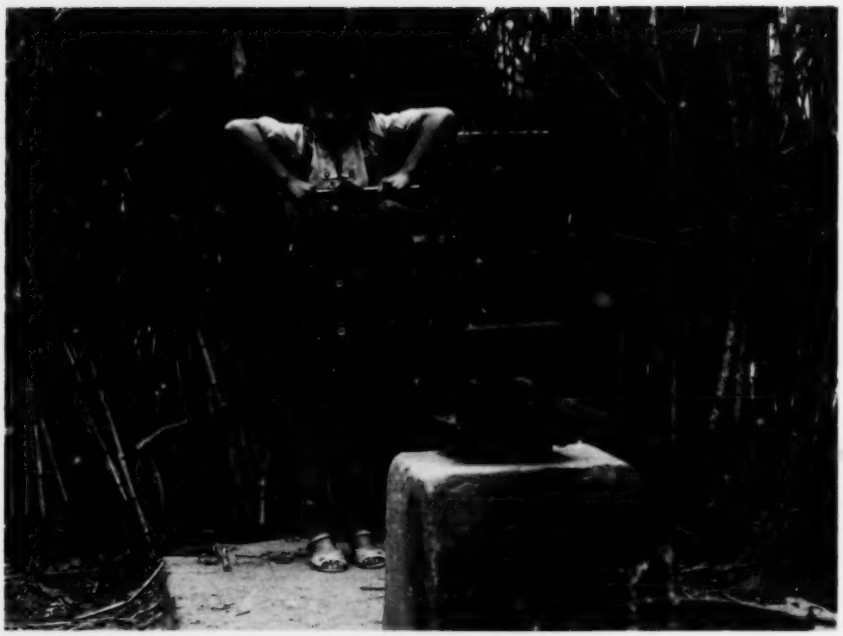
"We were shocked to see how some of these people got their water," Mr. Myint says, who has seen shallow handpumps operating only five metres from a latrine.

Now, word of the new handpumps and the clean water they bring is spreading like wildfire. "In Inner Mongolia, this water programme is being viewed by the people as their second revolution—following the coming of Mao Tse Tung—because of the great importance of water and health to rural life in the region," says one Chinese health official.

Indeed, throughout China, clean water and good health are inexorably linked. "This new water is fresh and beautiful," says Paitin Hui, a farmer in Jiuzhou, a small community in the municipality of Langfang, located in China's northeastern plain. Three years ago, 16 villages in this rural area were selected as field sites for testing different handpump models, to see which was best suited for large-scale production and use in China. Forty were installed, which now serve over 12,000 people.

"We used to walk several kilometres to get water from an irrigation well when our old, shallow pump went dry," Mr. Hui says. "That water was not very pure, and often the children became sick with intestinal problems. The situation today is much better."

The UNDP/World Bank initiative got underway in 1983 with laboratory testing of different handpumps in Beijing and other locations. This led to the field trials of four models in Langfang. These were the Afridev pump, developed in East Africa, the Nira pump, manufactured in Finland, the Kardia pump, developed in West Germany, and the Mark II pump, which was pioneered in India. The latter was ultimately selected with minor modifications for manufacture in China.



Photos by Sid Kane · UNDP

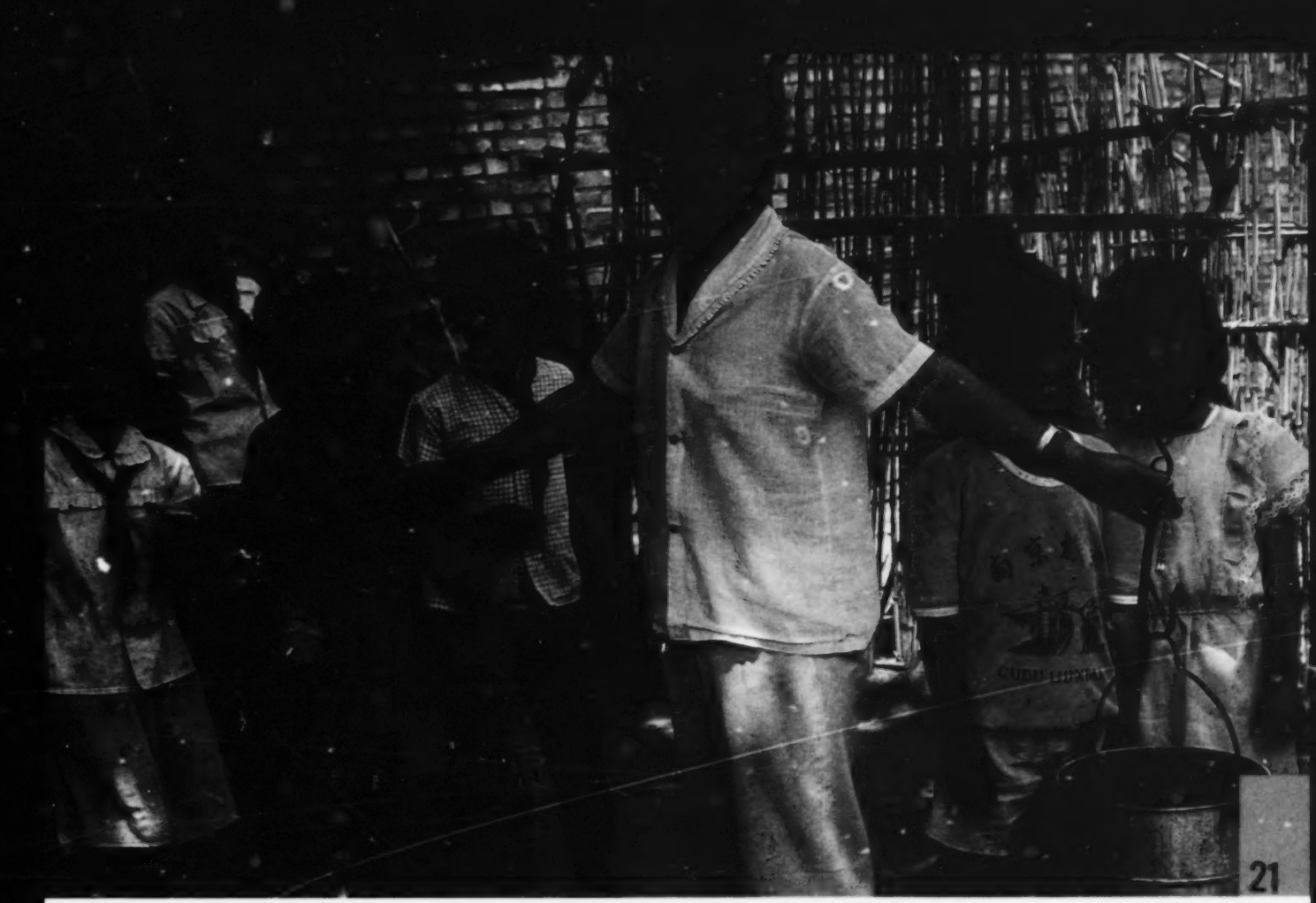
China's new handpump, modelled on the India Mark II, can be operated by children.

"We selected the Mark II because of its proven reliability in the field," says Mr. Myint. The main design alteration that was made to the Mark II was to the pump's handle. It was given a longer stroking distance, so that each stroke would deliver a greater water yield.

Following the completion of the demonstration project in Langfang, which is a short drive from Beijing, the Chinese government sought to extend the handpump initiative to Xinjiang and Inner Mongolia, two of China's poorest and most remote provinces. This phase of the programme was completed this year, with help from the Federal Republic of Germany, which provided a drilling rig and an operator. In all, 400 handpumps and 120 Ventilated Improved Pit latrines were installed in villages in Xinjiang and Inner Mongolia.

It was an alarming outbreak of water-borne diseases—especially hepatitis in southern parts of Xinjiang—that fueled the government's desire to see the project extended to the two regions. Xinjiang, the largest and most remote province in the country, is characterized by endless stretches of desert, ancient mosques, distant villages and snow-capped mountains. Its people are predominantly Muslim and are more closely linked with the Islamic traditions of eastern Afghanistan and Pakistan than with those of the rest of China.

The Muslim villages in Xinjiang that were hardest hit by the disease were those where people drink water from unsafe ponds and snow-fed trenches, often carrying their supply long distances in large earthen pots. The Chinese government is very concerned about averting social unrest in these communities. "Minorities in the



A rural Chinese woman carrying water home from a new well.

west have become discontent because of poor health conditions and services," said one official. "There have been clashes in the region before, and the government doesn't want to see water turn into a large political problem."

As a result of the water supply and sanitation programme, the incidence of hepatitis in the west has been brought under control. Now, Beijing is reviewing ways to expand the programme to other parts of the country, with help from UNDP and the World Bank.

As part of the project, handpump production plants employing newly trained Chinese technicians were opened in each province, with community members becoming involved in maintenance programmes. Most importantly, some 90,000 people in both areas now have a safe, reliable source of water.

"We're tapping cleaner, better aquifers that were never tapped before," says Mr. Arlosoroff. "At the start, we were surprised to find that across China there were millions of home-made shallow pumps, but not a single deep-set one," he says. "We thought how can this be? A country that has the hydrogen bomb?"

Yet the villagers who have benefited so far are only a drop in the bucket compared to the millions who still draw water from unsafe sources. This has set the stage for an ambitious expansion of the programme, set to get underway soon, involving a $120 million World Bank loan and an additional $120 million from the Chinese government. The aim is to bring new handpumps and safe water to several other provinces in China, including Yunnan, Hunan, Guanxi and Gansu, as well as unserved parts in Inner Mongolia and Xinjiang. "This stands to be one of the largest rural water supply and sanitation programmes that the Bank has ever undertaken," according to Mr. Arlosoroff. "For the low price of 60 cents, we can provide safe, reliable drinking water to a family of four." ■

Stalking an Ancient Disease of the Nile

By Emma Robson

Cairo, Egypt—Over the centuries the fate of Egypt seemed locked in a vicious circle: as man gained control of the unruly waters of the Nile and harnessed new plots of land to the production of food, nature rebelled, plaguing the waters with hordes of snails that subverted human well-being.

These snails, carriers of the debilitating and sometimes fatal parasitic disease schistosomiasis, seemed destined to thwart Egypt's long-term endeavours to attain self-sufficiency in food through year-round irrigation. On the one hand, the construction of dams and irrigation canals afforded protection from the recurring cycle of floods and droughts. They also produced electricity and allowed people to benefit from more water. But man's work created a perfect environment for the multiplication of snails of the species *Bulinus* and *Biomphalaria*, which carry the two types of schistosomiasis found in Egypt and thrive in the Nile's slower-moving waters.

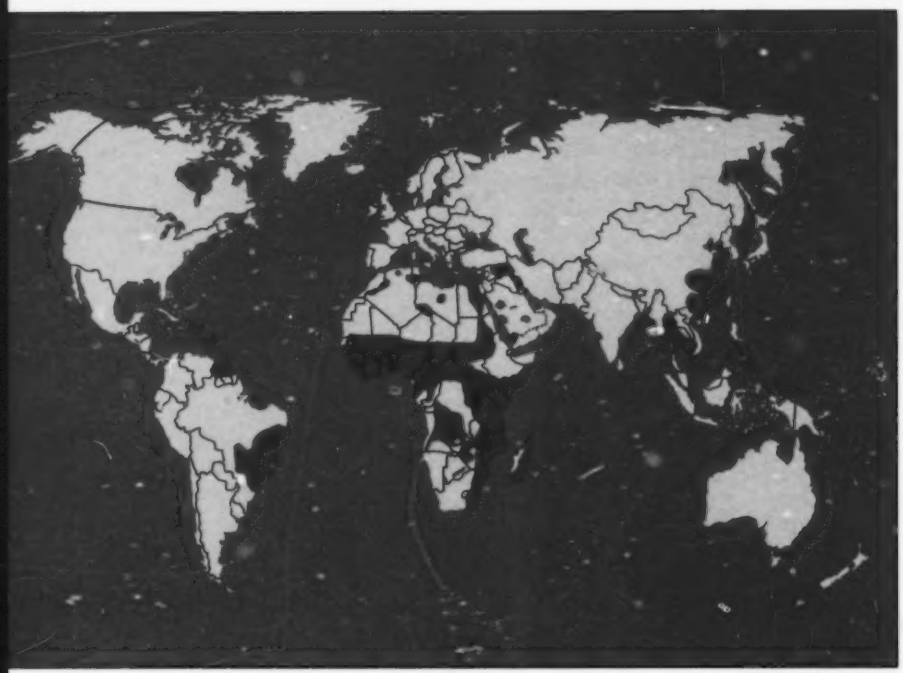
Among tropical diseases worldwide, schistosomiasis ranks second only to malaria in terms of human suffering and economic loss. Today, its three different species are estimated to affect more than 200 million people in Africa, the Middle East, Asia and South America and the Caribbean. Of the estimated 20 million people who have chronic schistosomiasis, approximately 200,000 die each year.

In Egypt, schistosomiasis is probably as old as the Nile itself. A number of calcified eggs found in mummies 3,000 years old revealed that ancient Egyptians suffered from this potentially fatal disease. Thirty centuries later schistosomiasis, or bilharzia as it is also known, is Egypt's number one health problem. It saps the energy and work output of up to 11 million Egyptians whose daily routine brings their skin into contact with the waters of the Nile. It leads to failure of the liver or kidneys, bladder cancer and sometimes death. In some villages along the Nile delta up to 90 per cent of the population is infected.

But today, thanks to more aggressive and effective control efforts, the prevalence of schistosomiasis has fallen nationally from more than 40 per cent in the 1930s to 20 per cent of the population in 1990. Much credit for that progress is due to the drug

The Nile is a vital source of fish and water for agriculture.

Emma Robson / UNDP



World-wide incidence of schistosomiasis. Source: Markell, 1986

praziquantel. Taken orally, one treatment of this drug has a 60 to 90 per cent chance of killing the parasites in the body. Developed in the 1970s, Egypt has been manufacturing *praziquantel* since 1988 at a cost that allows it to be distributed free of charge through the health system. The drug, which has no known side effects, is the preferred control method. The only effective molluscicide is now used sparingly since it pollutes the water and kills fish as well as snails.

Egypt's improved technologies and effective mass-media campaign are spurring hopes that the incidence of schistosomiasis will stabilize at below five per cent by the year 2000. Reaching that target should be greatly facilitated by the current work of the Ministry of Health and several Egyptian research institutes, which are working with the United States Agency for International Development (USAID) on a number of fronts, including development of a vaccine. One partner in the vaccine research, Egypt's Theodor Bilharz Research Institute, is also working to find a substance that kills snails, but is non-toxic to other life forms.

Finding an effective vaccine or an environmentally-safe molluscicide would be the best solution to the developing world's schistosomiasis problem. For while the drug *praziquantel* is effective in killing the parasites, it does not prevent reinfection. The 1,000 kilometres of the Nile that dissects the deserts and marshes along the length of Egypt provides ample opportunities for reinfection. These irrigation canals are Egypt's only surface water, and their presence explains why Egypt's 55 million people are huddled on 3.5 per cent of the country's land surface. The Nile is used to wash clothes, to perform the five daily ablutions before prayers, to irrigate crops, and as a source of fish and drinking water. With summer temperatures soaring above 40°C, the canals also offer irresistible swimming pools for children.

If the canals were not also used as a toilet, Egypt would be free from schistosomiasis. The parasite's survival depends on regular excretion by human beings, who are capable of releasing up to one million eggs in a day into the water. On contact with water, the larvae hatch and use tiny hairs on their bodies to swim to their intermediate hosts, the snails. At maturity, they seek a human home. When uninfected individuals wade in those same waters, the parasite bores its way through their immersed skin. The human blood system and vital organs provide the worms with a breeding ground and a suitable place to lay their eggs.

Over the years, the abdomen swells, the patient develops fever, and the blood vessels surrounding vital organs may rupture, causing internal bleeding. The patient may suffer from a range of other symptoms, including the vomiting of blood and the passing of blood in urine and stool. A few patients may become sterile or paralyzed, while others may develop cancer of the bladder, the most common form of cancer in Egypt.

Latrines appear to be the obvious answer. But while global studies show significant decreases in schistosomiasis after the provision of piped or alternative water supplies, showers and latrines, these facilities alone do not guarantee prevention. "It takes only one person to defecate in the canal to perpetuate the cycle," says Alan Fenwick, resident project manager for the USAID programme. According to Mr. Fenwick, certain types of water rats can also carry the schistosome worms. Moreover, there is a risk of sewage pipes breaking and spewing excreta into the water.

Before the introduction of *prazi-*

quantel, the main thrust in Egypt's strategy was to apply molluscicides on a massive scale. But the application of large quantities of chemicals in the 1960s and 1970s killed off all life in vast stretches of water. At the time, the only approved drug caused many side-effects and complications. It involved a series of daily intravenous injections, was painful, and prevented people from working. "Farmers would say they'd rather have schisto than get treated again," says Mr. Fenwick, a British-born scientist who was awarded an Order of the British Empire for his work on schistosomiasis in Sudan.

Mr. Fenwick believes that Egypt's biggest hope of controlling schistosomiasis lies in a vaccine. To develop a vaccine capable of killing such a large organism would be a tremendous breakthrough. "Successful vaccinations tend to be against smaller organisms, such as small pox or polio," says Mr. Fenwick. "However, there is no doubt that molecular biology and genetic engineering has improved by leaps and bounds over the last three or four years." In the United States, scientists at several research institutes have already identified promising vaccine candidates, which are being tested on baboons.

For the vaccine to be widely available, it would also have to be affordable. Egypt's control efforts are already straining the budget. At US$2.50 per dose, the drug costs alone of treating 11 million Egyptians with *praziquantel* would amount to more than ten per cent of the total annual national health budget of $250 million.

The effects of schistosomiasis are also burdening the farm economy, which employs a third of the Egyptian workforce, yet yields only half the country's food needs. "Schistosomiasis may not kill like malaria or cholera, but it seriously affects people's ability to work," says Dr. Aly Zein El Abdeen, President of Egypt's Theodor Bilharz Research Institute. Dr. El Abdeen cites Egyptian studies showing a 30 per cent drop in agricultural productivity among infected farmers.

Besides working on a vaccine, Mr. Fenwick, together with his American and Egyptian colleagues, will be spending the next nine years and nearly $40 million on more than 30 projects, ranging from improving diagnostic techniques to finding an alternative to *praziquantel* in the event that the parasites develop immunity.

Dr. El Abdeen says researchers at his Institute are focusing on some promising, environmentally safe molluscicide materials. "We have found some effective plant mollusci-

Anyone whose skin comes in contact with water contaminated with schistosomiasis can contract the disease.

Alan Fenwick has been researching schistosomiasis for more than 20 years.

cides and are now testing them for toxicity," he says. But he cautions that it may take years before an entirely acceptable molluscicide is found. "It's going to be thrown in the water, which is used for crops, is drunk by people and by animals, and where fish live, so we have to be dead sure that none of these are affected." ■

Photos by Franz Rabeau / UNDP

Faris Adly Mohamed (*above*) is 30 years old, but looks much older. Years of suffering from *Schistosoma mansoni* have affected his liver's ability to create protein—an ingredient vital for making and replacing skin cells and for building muscle. He also suffers from intense fatigue as a result of repeated blood loss. Since Mr. Adly Mohamed's abdomen began to swell three years ago, he has been unable to work as a farmer.

This is his second visit to hospital. Once again, he will receive diuretics to reduce the fluid that has built up around his liver as a result of the accumulation of thousands of parasitic eggs. In a few weeks, the swelling will go down and treatment with the drug *praziquantel* will kill the worms in his body, but not prevent reinfection. His liver is unlikely to ever again function normally. The effects of schistosomiasis can be highly debilitating. "You are dizzy, very, very tired and it is difficult to sit or go to the toilet," says Mr. Adly Mohamed. "You just want to lie down all the time."

Tapping Fog For Water

By I. Rajeswary

I. Rajeswary, UNDP

Dr. Robert Schemenauer stands by an instrument that collects fog moisture for chemical analysis.

Dr. Robert Whitcombe

Fog moisture collecting screens and 2,700-litre storage tanks at Qaftawt.

Dhofar, Oman—As research scientists Robert Schemenauer and Maria del Pilar Cereceda pull their nylon anoraks tightly around them atop the limestone hills of Dhofar, a group of men from the United Arab Emirates in their cotton, ankle-length *dishdashas* relish a picnic in the fog. To the visitors from the Gulf, the fog that hangs for three months each year over these 900 metre-high hills is a refuge from the scorching sun that beats down on the plains of the Arabian Peninsula. For the scientists, the fog offers an important source of water for agriculture, forestry, aquifer recharge and drinking in a land where water is scarce.

Nearby are metal tanks topped by huge vertical screens with polypropylene meshes designed to catch tiny droplets of fog and drizzle. The scientists are experimenting with meshes of different types to determine which one traps the most water. "Small fog droplets hit the screen, coalesce and run down the mesh into the tank," explains Dr. Schemenauer of the Canadian Atmospheric Environment Service. How much is collected depends on the density of the fog, how long it hangs over the hills, and windspeed.

After a month-long trial in Dhofar, three different fog collectors net the same amount of water. "The next step is for our team to determine which of the three is least expensive and most easy to construct and maintain," says Professor Cereceda of the Pontifical Catholic University of Chile. She is supervising Gonzalo Frigerio, a student from the Geography Department of the same university. Mr. Frigerio is also training Omani geographer

Dr. Robert Whitcombe

Fog moisture intercepted by a wild olive tree completely filled this tank.

Mohamed al-Maashani to take measurements from the instruments that are being used. Wearing a pair of battered knee-high Wellington boots, Professor Cereceda squelches through mud to a spot where eight plastic hoses drain into plastic pails. The hoses are connected to a pole topped with a rotating plastic mesh to determine which wind direction yields the most water.

Dr. Schemenauer and Professor Cereceda are no strangers to fog moisture collection, having experimented with it extensively in Chile and recently in Peru. Their efforts led to the establishment, in 1987, of a Chilean pilot project sited on a ridge called El Tofo, 780 metres above sea-level. The project was designed to assess all the conditions associated with the formation of high elevation fog or *camanchaca*, as it is known in Chile. They also investigated the feasibility of collecting water on a large scale and piping it to the nearby fishing village of Chungungo on Chile's arid coast.

Over a two-year period from 1987-1989, the 50 fog collectors in Chile yielded 10,000 litres of water per day. When a pipeline currently under construction is completed, each villager from Chungungo will obtain 29 litres a day—twice the amount of water they presently purchase from a mobile water tanker.

In Oman, fog moisture collection experiments were initiated in 1985 by the country's Planning Committee for Development and Environment in the Southern Region with support from the Ministry of Agriculture and Fisheries. Four years later, the work intensified with help from the United Nations Development Programme (UNDP) and the World Meteorological Organization (WMO). Assistance was also sought from the Canadian Atmospheric Environment Service and the Pontifical Catholic University of Chile.

Oman's annual rainfall is variable but it is always greater on the mountains of Dhofar because of the monsoon, or *khareef*. Between June and September, warm, moist monsoon winds from the south-west circulate over the Indian Ocean and Arabian Sea, and are subsequently cooled by the coastal currents off Dhofar. As the moving air mass is chilled, banks of fog and low clouds form and move over the Dhofar mountains.

Robert Whitcombe, a British ecologist with the Planning Committee, is responsible for most of the early work done in Dhofar. Last year, the Planning Committee, through UNDP and WMO, obtained the services of Chilean geographer Juan Barros, who has done work on the *camanchaca*, to conduct a wide range of experiments in Oman.

One of the early experiments was to determine which altitude yielded the most water. Between July and September 1989 a square-metre screen erected at an altitude of 480 metres yielded six litres of fog water a day. In another spot, at 920 metres above sea-level, a screen of the same

size netted 80 litres of water a day.

Earlier this year, the Planning Committee engaged a hydrologist, engineers and an economist from a Danish consulting firm to investigate the feasibility of supplying fog water on a long-term basis to rural settlements on the Dhofar hills and for using the water for afforestation and aquifer recharge.

Dr. Whitcombe says that if fog water is used to irrigate young trees for a year or two until they mature, these trees will be able to intercept fog, irrigate themselves and possibly provide surplus water that will recharge the natural underground aquifers. Over the monsoon season last year, an isolated tree intercepted 60,000 litres of water.

There is no easy access to water in the rural areas of southern Oman. Currently, most domestic water comes from government boreholes drilled near rural settlements. "But the villagers have to collect water in their pick-up trucks or pay someone else to carry it for them," says Dr. Whitcombe.

He concedes that fog water collection is seasonal and is only practical where fog is dense. "We also have to consider costs — such as construction of the screens, installation, maintenance and storage, and compare them with the costs of the existing boreholes system," he notes.

It is hoped that fog water stored during the monsoon season will help provide villagers with a steady water supply throughout the year. In an arid region where average rainfall is only ten inches, every drop counts and the fog may constitute a valuable supplementary source of water that would make a dramatic improvement in the lives of the people. ■

Professor Maria del Pilar Cereceda and her assistant investigate which screen position will yield most fog water.

I Rajeswari, UNDP

Helping the Poorest: Norway's Water and Health Strategy

David Kinley - UNDP

NORAD's Ingrid Ofstad tries out an India Mark II in New Delhi.

Each year, Norway spends over US$900 million—or 1.1 per cent of its gross national product—on development aid, making it the world's most generous aid donor on a per capita basis. Roughly half of these funds are channelled through the multilateral aid agencies of the United Nations. The other half is administered by NORAD, the Norwegian Agency for Development Co-operation.

The overall aim of Norwegian assistance is to contribute to a permanent improvement in the economic, social and political conditions of poor people in developing countries. More than $25 million of NORAD's budget each year is devoted to improving water and sanitation services in a select number of the poorest developing countries, particularly in South Asia and Africa. In recent years, NORAD-assisted water and sanitation activities have concentrated on five countries: Kenya, Sri Lanka, Tanzania, Zambia and Zimbabwe.

This concentration on a small group of countries reflects NORAD's philosophy that development aid works best when there is a long-term partnership between donor and recipient. "We feel we need to get to know our partners well," says Ingrid Ofstad, who heads NORAD's health division, which oversees programmes in the sector. "Our ongoing experience with these governments has helped spawn a positive evolution in our approaches to the water and health sectors."

When NORAD began supporting water supply programmes in Africa in the 1970s, emphasis was placed on "rapid installation of new rural water facilities," says Ms. Ofstad. "We were pushing to maximize expansion of new services and we made investments which were costly to install but easy to maintain," she says. "Sometimes, however, the quest for quantity overtook quality in our projects."

Over the years of the International Drinking Water Supply and Sanitation Decade, NORAD officials learned the value of continuing dialogue with its developing country partners. On the macro-level, NORAD supported Master Planning in several African countries—a process that has helped the governments set clear priorities and objectives for national water and health programmes. At the same time, NORAD's growing familiarity with the rural social structures led to a shift toward community-based development efforts.

"Increasingly, requests for new projects come from the villages through their governments," says Ms. Ofstad. "Responsibility for construction and maintenance of new systems rests with the rural communities themselves."

Until recently, expanding water supplies has taken precedence over sanitation facilities in NORAD programmes. Current programmes seek a balance between water supplies, sanitation facilities and health education at the community level. Community-based services, moreover, are integrated into broader activities which can generate incomes and jobs — which in turn support new water and health services.

"We are successfully using the integrated approach in Tanzania and Sri Lanka," says Ms. Ofstad. "Promoting such income-generating activities alongside water and sanitation is especially important in the remote areas where we work, far from the capital cities."

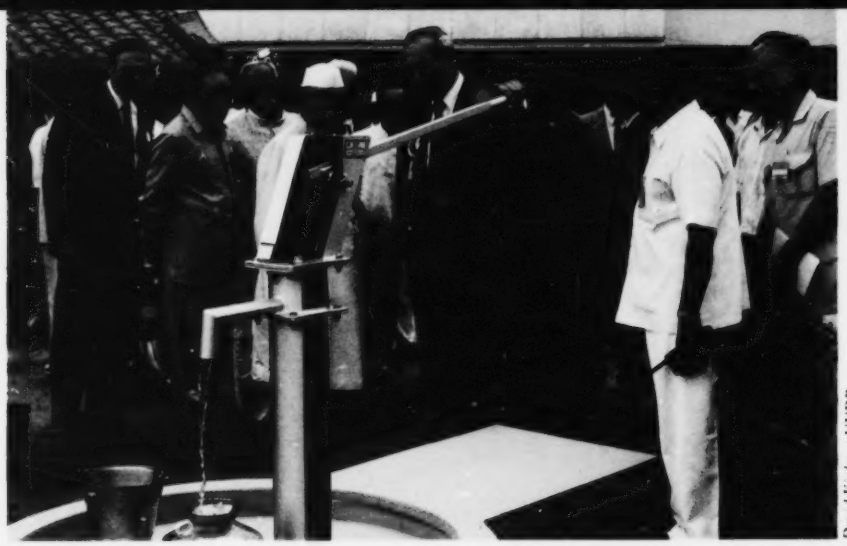
Beyond their long record as a major aid donor, Norwegians take pride in the fact that their bilateral aid has been completely untied. "None of the funds we provide for projects in the developing world are restricted to purchases from Norway," says Ms. Ofstad. "This allows our recipient governments to obtain the best possible equipment and services the market has to offer, and at competitive prices."

NORAD has also cultivated a strong working partnership with other donor agencies, especially its Nordic neighbours. Norway provides substantial funding for the Water and Sanitation Programme of the United Nations Development Programme (UNDP) and World Bank, and co-finances projects of the World Bank and African Development Bank.

Norway has also played an active role in shaping the Water and Sanitation Collaborative Council, a grouping of about 40 donor agencies active in developing countries. "Our experience shows that there is a strong need for co-ordination at the international level," says Ms. Ofstad. "But the bottom line is that recipient governments must take the lead in setting policies and co-ordinating external support agencies."—**DK**

Global Meeting Sets Water and Health Targets to Year 2000

By David Kinley



David Kinley / UNDP

UNDP Administrator William H. Draper III (centre) and Indian Vice President Dr. Shanker Dayal Sharma (left of Mr. Draper) examine an India Mark II handpump in New Delhi.

New Delhi, India—Without new strategies and more money, the hardship faced by more than a billion people lacking safe water and sanitation "will turn into an unmanageable crisis." This warning comes from "The New Delhi Statement," issued here in mid-September by over 600 representatives from developing countries and aid organizations.

The global consultation was organized to assess the achievements and shortfalls in water and sanitation during the 1980s, and to set new goals to the year 2000. The group concluded five days of deliberations with a four-point programme aimed at increasing services, especially in poor communities, during the 1990s. The statement calls for increased financing, better environmental management, a new facilitating role for government and greater participation by the private sector, poor communities and women in order to "serve the unserved."

Although the International Drinking Water Supply and Sanitation Decade, now ending, did not achieve its ambitious goals, it has shown impressive results. During the last ten years over 1.3 billion people have been supplied with uncontaminated drinking water and 750 million with new sanitary facilities. But despite these unprecedented efforts, according to the New Delhi Statement, one in three of the developing world's poorest peoples still lack the basic services that the world's governments agreed in 1977 were essential to human development.

"Entering the 1990s, population growth remains unchecked. Infrastructure in many cities is stretched to the breaking point. Uncontrolled pollution puts further stress on the living environment and aggravates competition for increasingly expensive water resources," the statement says. "Without fundamentally new approaches, the hardship will turn to an unmanageable crisis."

Unlike the Water and Sanitation Decade coming to an end, the New Delhi plan does not call for services for all by the year 2000, but instead for realistic spending targets. "To reach full coverage by the year 2000 with present technologies and approaches would require five times the current investment level of US$10 billion a year," the statement says. "That is not a viable option." But cutting costs by half and doubling the finances to $20 billion a year could allow service for all the world's people "to be approached by the end of the century."

"The Decade has proven that the success of water management in third world countries must spring from the management and control by the people themselves," said Margaret Mwangola, director of the Kenya Water for Health Organization (KWAHO), a non-governmental group. "The governments which have supported this new approach need to be applauded."

William H. Draper III, Administrator of the United Nations Development Programme (UNDP), affirmed the organization's commitment to greater support for the sector. "Over the next decade," said Mr. Draper, "we will urge the governments we serve to devote more and more of the funds UNDP allocates to them to improve water and sanitation facilities for their citizens. We will do our part and I urge all other external support agencies at this consultation to increase their contributions to the sector."

The New Delhi meeting was sponsored by UNDP and hosted by the Government of India, with the co-sponsorship of the United Nations Steering Committee for Co-operative Action and the Collaborative Council, a group of donor agencies. Participation ranged from major lenders such as the The World Bank and Asian Development Bank to bilateral aid organizations from Europe, Japan and the United States, United Nations agencies, developing-country governments and numerous private groups.

The New Delhi Statement was forwarded to the United Nations General Assembly for its review of the UN Water and Sanitation Decade in October 1990. Because women and children are the hardest hit by water-related diseases, the statement was referred for action to the World Summit for Children, held at the United Nations September 29 and 30. Copies of the Statement are available from *SOURCE*. ■

LOOKING AHEAD

continued from page 2

worm in 20 villages from 59.6 per cent in 1983-84 to 11.3 per cent in 1986-87. In three villages with prevalence rates as high as 62 per cent, the occurrence of Guinea worm plummeted to zero. By increasing clean rural water supplies, India reduced Guinea worm disease from a nationwide total of 44,818 cases in 1983 to 7,811 cases in 1989. These examples must be replicated in all endemic areas. But so far, only India and Nigeria have established explicit policies making Guinea worm villages a priority for rural water supply.

At the end of the Water Decade, Guinea worm is close to eradication in Pakistan. India is nearing its goal of eradication by 1991. We must now focus our attention on Africa, particularly West Africa. With the help of Global 2000, Ghana and Nigeria have already conducted nationwide surveys to identify all affected villages. Only Cameroon among the neighbouring endemic Francophone states has completed a national survey. While civil wars impair access to much of the endemic zone in East Africa, there is no excuse for failing to mobilize West Africa now.

The significance of this initiative goes beyond eradicating Guinea worm. By mobilizing villagers to play an active role in improving their own health, which will improve agriculture and education, and by energizing a new generation of public health workers in developing countries around a successful campaign, the eradication of Guinea worm is contributing to sustained development of desperately poor communities. The liberating effects of this effort will be felt for many years to come. ■

WATER AND HEALTH

BENEFITS FROM IMPROVEMENT IN WATER SUPPLY AND SANITATION: SURVEY AND ANALYSIS OF THE LITERATURE ON SELECTED DISEASES
WASH Technical Report No. 66
73 pages
By Steven A. Esrey, James Potash, Leslie Roberts and Clive Shiff

Available in English free of charge from:
Water and Sanitation for Health (WASH)
1611 N. Kent Street
Arlington, VA 22209, USA.

Facts, figures, maps and recent findings on six major water and sanitation-related diseases are condensed in this lucid report. It describes diarrhoea, ascariasis, Guinea worm, hookworm, schistosomiasis and trachoma, and summarizes environmental factors associated with these diseases. Included are estimates of the impact of safe water supplies and sanitation on the incidence of these diseases, child mortality and morbidity. From their extensive analysis of nearly 150 studies, the authors list factors to achieving broad health impacts. Safe excreta disposal and the availability of an ample supply of water for personal hygiene are termed key factors.

COMMUNITY MANAGEMENT OF RURAL WATER SUPPLY AND SANITATION SERVICES
49 pages
By Carolyn McCommon, Dennis Warner and David Yohalem

Available free in English from:
The World Bank
Water and Sanitation Division
1818 H Street NW
Washington, DC 20433, USA.

Produced by the UNDP-World Bank Water and Sanitation Programme in collaboration with USAID's Water and Sanitation for Health project, this paper examines seven water and sanitation projects in Africa, the Philippines and the Americas. It identifies key factors leading to enhanced management of facilities by communities. It also analyses the relationship between communities and external agencies. Describing growth toward full community management as a five-step process, it outlines the kind of external support appropriate to each level.

FROM HANDPUMPS TO HEALTH
By Maggie Black
133 pages
Price US$17.00

Available in English from:
UNICEF
Programme Publications, Room 12G
Three United Nations Plaza
New York, NY 10017, USA.

Drawing on UNICEF's experiences in Bangladesh, India and Nigeria, this report traces the evolution of the handpump from the early 1970s to today's improved designs.

New Videos on Water and Health

More than one billion people in the developing world rely on risky water supplies. Waterborne diseases take a heavy toll—especially among the young.

Now UNDP offers three colour videos on the positive steps being taken to address this human suffering.

Each video costs US$20. Cheques or money orders must be in US dollars. For purchase or further details contact:

UNDP, Division of Information
One UN Plaza, Room DC1-1909
New York, NY 10017, USA
Telephone (212) 906 5303

The Water of *Ayole* shows how a poor village in the West African nation of Togo is making its new water system work. Directed and produced by award-winning filmmaker Sandra Nichols, it is available in English and French as a 28-minute video tape (VHS-NTSC or PAL).

The Fiery Serpent provides vivid lessons from Nigeria about the prevention and control of the dreaded Guinea worm disease, which afflicts around ten million people worldwide, mainly in Africa. Available in English and French as a 20-minute video tape (VHS-NTSC or PAL).

Safe Water 2000 draws on film footage and photos from throughout the developing world to highlight Decade achievements—including expanded water and sanitation services, community management, low-cost technologies and women's participation—and portrays the challenges for the international community to the year 2000. Available in English and French as a 15-minute video tape (VHS-NTSC, SECAM or PAL). The tape comes with a 32-page companion booklet.

Photo: Sandra Nichols

Courtesy of Source, UNDP